THE ADVICE OF W. P. TO Mr. SAMUEL HARTLIB.

FOR

The Advancement of some particular Parts of LEARNING.

W. PWP 17 H

LONDON, Printed Anno Dom. 1647.

Educ 6606.47 ✕

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4727

To his honoured friend Maſter SAMUEL HARTLIB.

SIR,

I Have had many flying thoughts, concerning the Advancement of Reall Learning in generall, but particularly of the Education of Youth, Mathematicks, Mechanicks, Phyſick, and concerning the Hiſtory of Art and Nature, with ſome more ſerious ones concerning your owne moſt excellent advices for an Office of Publick addreſſe. And indeed they were but flying thoughts, for ſeeing what vaſt ſummes were requiſite to carry on thoſe deſignes, and how unwilling or unable men generally were to contribute towards them, I thought it but labour loſt to fix my mind much upon them.

But it having pleaſed God unexpectedly, to make me the Inventor of the Art of Double Writing, daily and hourly uſefull to all ſorts of Perſons in all places of the world, and that to perpetuity, I conceived that if there were underſtanding enough in Men to be ſenſible of their own good, and Thankfulneſſe or honeſty enough to reward the Contrivers of it, ſuch Meanes might be raiſed out of this Art as might at leaſt ſet the aforementioned Deſigns on float, and make them ready to ſet ſaile toward the haven of perfection upon every opportunity of ſtronger gales. And thereupon I reaſ-

reaſſumed my Meditations, which I here give you, deſiring you and your Ingenious Freinds to remeditate upon them and correct them, but withall to think of the beſt Courſe, how to improve my Invention to ſuch advantage, as may if poſſible, make us capable of enjoying more then bare Ideas of that Happineſſe, which the atchievements of our deſigns promiſeth. I ſhall deſire you to ſhew them unto no more then needs you muſt, ſince they can pleaſe only thoſe few, that are Reall Friends to the Deſigne of Realities, not thoſe who are tickled only with Rhetorical Prefaces, Tranſitions, & Epilogues, & charmed with fine Alluſions and Metaphors, (all which I do not condemn) wherewith, as I had no abilities to adorne my diſcourſe, ſo I wanted all other requiſites thereunto, Having written it (as Your ſelf muſt beare me witneſſe) at your own Importunity in the midſt of my cares and indeavours, to perfect mine Invention, and which is work in the midſt of my hard and perhaps unprofitable labour, to prevent the ingratitude and backwardneſſe of men to reward him, who ſhall earneſtly labour to expreſſe himſelfe,

London the 8. *January.* $164\frac{7}{8}$

Yours and your deſignes

moſt affectionate ſervant,

W. P.

THE Advice

For Advancement of ſome particular Parts of Learning.

TO give an exact Definition or nice Diviſion of Learning, or of the Advancement thereof, we ſhall not undertake (it being already ſo accurately done by the great Lord *Verulam*) Intending onely to ſhew where our owne ſhoe pincheth us, or to point at ſome pieces of Knowledge, the improvement whereof (as we at leaſt conceive) would make much to the enerall good and comfort of all mankind, and withall to deliver our own opinion by what meanes they may be raiſed ſome one degree neerer to perfection.

But before we can meddle with this great Work, we muſt firſt think of getting Labourers, by appointing ſome Generall Rande vouz, where all men either able or willing to take up armes againſt the many difficulties thereof, may finde entertainment. That is to ſay, We muſt recommend the Inſtitution of an Office of common Addreſſe according to the projection of Maſter *Hartlib* (that painfull and great inſtrument of this Deſigne) whereby the wants and deſires of all may bee made knowne unto all, where men may know

what is already done in the buiſineſſe of Learning. What is at preſent in doing, and what is intended to be done: to the end, that by ſuch a generall communication of deſignes, and mutuall aſſiſtance ;: The wits and endevours of the world may no longer be as ſo many ſcattered coales or firebrands, which for want of union, are ſoone quenched, whereas being but layed together they would have yeeled a comfortable light and heat. For me thinkes the preſent condition of men is like a field where a battle hath beene lately fought, where we may ſee many leggs, and armes, and eyes lying here and there, which for want of a union and a ſoule to quicken and enliven them, are good for nothing but to feed Ravens; and infect the aire. So we ſee many Wittes and Ingenuities lying ſcattered up and downe the world, whereof ſome are now labouring to doe what is already done, and puſling themſelves to reinvent what is already invented, others we ſee quite ſtuck faſt in difficulties, for want of a few Directions, which ſome other man (might he be met withall) both could and would moſt eaſily give him; againe one man wants a ſmall ſumme of mony, to carry on ſome deſigne, that requires it, and there is perhaps another, who hath twice as much ready to beſtow on the ſame deſigne; but theſe two having no Meanes ever to heare the one of the other, the good Work intended and deſired, by both parties doth utterly periſh and come to nothing: But this we paſſe over ſleightly, though very fundamentall to our buſineſſe, becauſe the Maſter-builder thereof himſelf hath done it ſo ſolidly. Having by this means procured work-men and what elſe is neceſſary to the Worke, that which we would have them to labour in, is, How to finde out ſuch Arts as are yet undiſcovered, How to learne what is already known, by more compendious and facile wayes, and to apply it to more, and thoſe more noble uſes, how to work in men an higher eſteeme of Learning ſo as to give occaſion, encouragement and opportunity to more Men to apply themſelves to its Advancement.

The next thing then to be done, will be, Firſt, to ſee what is well and ſufficiently done already, exploding whatſoever is nice, contentious and meery phantaſticall. All which muſt in

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ſome meaſure be ſuppreſſed and brought into diſgrace and contempt with all men.

2. This ſurvey may be made by peruſing al Booksand taking notice of all Mechanicall Inventions.

3. In this peruſall, all the Reall or Experimentall Learning may be ſifted and collected out of the ſaid Books.

4. There muſt be appointed able Readers of all ſuch Books, with certaine and well limited Directions what to collect out of them.

5. Every Book muſt be ſo read by two ſeverall Perſons apart, to prevent miſtakes and failings from the ſaid Directions.

6. The Directions for Reading muſt be ſuch, as the Readers obſerving them, may exactly agree in their Collections.

7. Out of all theſe Bookes one Booke or great Worke may be made, though conſiſting of many Volumes.

8. The moſt Artificiall Indices Tables or other Helps for the ready finding, remembring, and well underſtanding all things contained in theſe Bookes muſt be contrived and put in practice.

Having thus taken the height or pitch whereunto al Arts and Sciences whatſoever, are already come; and obſerved where they now ſtick, the ableſt Men in every reſpective Faculty muſt be ſet apart, to drive them on further with ſufficient maintenance, and encouragement for the ſame. Whereunto it isrequiſite that two or three, one under another, be employed about each Faculty, to the end that ſome of them dying, or any other wiſe failing, there may never want men acquainted with the whole Deſigne, and able to carry it on, with the help of others to be admitted under them; And that at leaſt yearly Accompts be taken of thoſe mens endeavours, and rewards be proportioned to them accordingly.

And now we ſhall think of whetting our tooles and preparing ſharp Inſtrumens for this hard work, by delivering our thoughts concerning Education, which are,

1. That there be inſtituted *Ergaſtula Literaria*, Literary-

work-houſes, where Children may be taught as well to doe ſomething towards their living, as to Read and Write.

That the buſineſſe of Education be not (as now) committed to the worſt and unworthieſt of men, but that it be ſeriouſly ſtudied and practiſed by the beſt and abler perſons.

That all Children of above ſeven yeares old may be preſented to this kind of Education, none being to be excluded by reaſon of the poverty and unability of their Parents, for hereby it hath come to paſſe, that many are now holding the Plough, which might have beene made fit to ſteere the State. Wherfore let ſuch poor children be imployed on works whereby they may earne their living, equall to their ſtrength and underſtanding, and ſuch as they may performe as well as elder and abler perſons, *viz.* attending Engines, &c. And if they cannot get their whole living, and their Parents can contribute nothing at all to make it up, let them ſtay ſomewhat the longer in the Work-houſe.

That ſince few children have need of reading before they know, or can be acquainted with the Things they read of, or of writing, before their thoughts are worth the recording, or they are able to put them into any forme, (which we call inditing) much leſſe of learning languages, when there bee Books enough for their preſent uſe in their owne mother Tongue; our opinion is, that thoſe Things being withall ſomewhat above their capacity, (as being to be attained by Judgement, which is weakeſt in children) be deferred awhile, and others more needfull for them, ſuch as are in the order of Nature before thoſe afore mentioned, and are attainable by the help of Memory, which is either moſt ſtrong or unpreoccupied in children, be ſtudied before them. We wiſh therefore that the Educands be taught to obſerve and remember all ſenſible Objects and Actions, whether they be Naturall or Artificiall, which the Educators muſt upon all occaſions expound unto them.

That they uſe ſuch Exerciſes whether in work, or for recreation, as tend to the health, agility and ſtrength of their bodies.

That they be taught to Read by much more compendious meanes

meanes then are in common uſe, which is a thing certainly very eaſie and feaſible.

That they be not onely taught to Write according to our Common Way, but alſo to Write Swiftly and in Reall Characters, as likewiſe the dextrous uſe of the Inſtruments for Writing many Copies of the ſame thing at once.

That the Artificiall Memory be thought upon, and if the precepts thereof be not too farre above Childrens Capacities, We conceive it not improper for them to learn that alſo.

That in no caſe the Art of Drawing and deſigning be omitted, to what courſe of Life ſoever thoſe children are to be applied, ſince the uſe thereof for expreſſing the conceptions of the mind, ſeemes (at leaſt to us) to be little inferiour to that of Writing, and in many caſes performeth what by words is impoſſible.

That the Elements of Arithmetick and Geometry be by all ſtudied, being not onely of great and frequent uſe in all humane Affaires but alſo ſure guides and helps to Reaſon, and eſpeciall Remedies for a volatile and unſtedy mind.

That effectuall Courſes be taken to try the Abilities of the Bodies and Minds of Children, the ſtrength of their Memory, inclination of their Affections either to Vice or Vertue, and to which of them in particular, and withall to alter what is bad in them, and increaſe and improve what is good, applying all, whether good or bad, to the leaſt Inconveniencie and moſt Advantage.

That ſuch as ſhall have need to learne Forraine Languages (the uſe whereof would be much leſſened, were the Reall and Common Characters brought into practiſe) may be taught them by incomparably more eaſie wayes then are now uſuall.

That no ignoble, unneceſſary, or condemned Part of Learning be taught in thoſe houſes of Education, ſo that if any man ſhall vainely fall upon them, he himſelfe onely may be blamed.

That ſuch as have any naturall ability and fitneſſe to Muſick be Encouraged and Inſtructed therein.

That all Children, though of the higheſt ranke, be taught ſome gentile Manufacture in their minority, ſuch as are Turning of curious Figures, Making

Making Mathematicall Instruments, Dialls, and how to use them in Astronomicall Observations.

Making Watches and other Trochilick motions.

Limning and Painting on Glasse or in Oyle Colours.

Graving, Etching, Carving, Embossing and Molding in sundry matters.

The Lapidaries Art of knowing, cutting and setting Iewells.

Grinding of Glasses Dioptricall and Catoptricall.

Botanicks and Gardening.

Making Musicall Instruments.

Navarchy and making Modells for buildings and rigging of Ships.

Architecture and making Modells for houses.

The Confectioners, Perfumers or Diers Arts.

Chymistry, refining Metalls and Counterfeiting Iewells.

Anatomy making Sceletons and excarnating bowells.

Making Mariners Compasses, Globes, and other Magnetick Devices.

And all, for these Reasons.

1. They shall be lesse subject to be cousened by Artificers.

2. They will become more industrious in generall.

3. They will certainly bring to passe most excellent Works, being as Gentlemen, ambitious to excell ordinarie Work-men.

4. They being able to make Experiments themselves, may doe it with lesse charge, and more care then others will doe it for them.

5. The *Rest. Artium* will be much advanced, when such as are rich and able, are also willing to make Luciferous Experiments.

6. It may engage them to be Mœcenates and Patrons of Arts.

7. It will keepe them from worse occasions of spending their time and estates.

8. As it will be a great Ornament in prosperity, so it will be a great Refuge and stay in adversity and common calamity.

As for what remaines of Education, we cannot but hope that

that thoſe, whom we have deſired ſhould make it their trade, will Supply it, and render the Idea therof much more perfect.

We have already recommended the ſtudie of the Elements of Arithmetick and Geometry to all Men in generall, but they being the beſt grounded parts of Speculative knowledge, and of ſo Vaſt uſe in all Practicall Arts. We cannot but commend deeper enquiries into them. And although the way of advancing them in particular, may be drawne from what we have already delivered, concerning the Advancement of learning in generall, yet for the more explicite underſtanding of our meaning herein, we referre to Maſter *Polls* moſt excellent Idea thereof, written to Maſter *Hartlib*.

In the next place for the Advancement of all Mechanicall Arts and Manufactures, we wiſh that there were erected a Gymnaſium Mechanicum or a Colledge of Trades-men (or for more expedition untill ſuch a place could be built, that the moſt convenient houſes for ſuch a purpoſe may be either bought or hired) wherein we would that one at leaſt of every Trade (but the Prime moſt Ingenious Work-man, the moſt deſirous to improve his Art,) might be allowed therein, a handſom dwelling Rent free, which with the Credit of being admitted into this Society, and the quick ſale which certainly they would have of their Commodities, when all men would repaire thither, as to a Market of rare and exquiſite pieces of Workmanſhip, would be a ſufficient Motive to attract the very ableſt Mechanicks, and ſuch as we have deſcribed, to deſire a fellowſhip in this Colledge.

From this Inſtitution we may clearly hope when the excellent in all Arts are not onely Neighbours, but intimate Friends and Brethren, united in a Common deſire and zeal to promote them, that all Trades will miraculouſly proſper, and new Inventions would be more frequent, then new faſhions of Clothes and houſehold-ſtuffe. Here would be the beſt and moſt effectuall opportunities and meanes, for writing a Hiſtory of Trades in perfection and exactneſſe, and what Experiments and ſtuffe would all thoſe Shops and Operations afford to Active and Philoſophicall heads, out of which, to extract that Interpretation of Nature, whereof there is ſo little, and that ſo bad as yet extant in the world?

Within the walls of this Gymnaſium or College, ſhould be a Noſecomium Academicum according to the moſt exact and perfect Idea thereof a compleate *Theatrum Botanicum*, ſtalls and Cages for all ſtrange Beaſtes and Birds, with Ponds and Conſervatories for all exotick Fiſhes, here all Animalls capable thereof ſhould be made fit for ſome kind of labour and imployment, thaa they may as well be of uſe living as dead; here ſhould be a Repoſitorie of all kind of Rarities Naturall and Artificiall pieces of Antiquity, Modells of all great and noble Engines, with Deſignes and Platformes of Gardens and Buildings. The moſt Artificiall Fountaines and Water-works, a Library of Select Bookes, an Aſtronomicall Obſervatory for celeſtiall Bodies and Meteor, large pieces of Ground for ſeverall Experiments of Agriculture, Galleeries of the rareſt Paintings and Satues, with the faireſt Globes, and Geographcall Maps of the beſt deſcriptions, and ſo farre as is poſſible, we would have this place to be the Epitome or Abſtract of the whole world. So that a man converſant within thoſe walls, would certainly prove a greater Schollar, then the Walking Libraries ſo called, although he could neither write nor read. But if a Child, before he learned to read or write, were made acquainted with all Things, and Actions (as he might be in this Colledge) how eaſily would he underſtand all good Bookes afterwards, and ſmell out the fopperies of bad ones. As for the Situation, Modell, Policy Oeconomy, with the Number of Officers and Retainers to this Colledge, and the Priviledges thereof, it is as yet time enough to delineate. Only we wiſh that a Society of Men might be inſtituted as carefull to advance Arts as the Ieſuites are to Propagate their Religion for the government and mannaging of it.

But what reliſh will there be in all thoſe dainties whereof we have ſpoken, if we want a palate to taſt them, which certainly is Health, the moſt delirable of all earthly bleſſings, and how can we in any reaſon expect Health, when there are ſo many great difficulties in the curing of diſeaſes and no proportionable Courſe taken to remove them? we ſhall therefore purſue the Meanes of acquiring the Publicke Good and com-

comfort of Mankind a little further, and vent out conceits concerning a Nosocomium Academicum or an Hospitall to cure the Infirmities both of Physician and Patient.

We intended to have given the most perfect Idea of this Nosocomium Academicum, and consequently to have treated of the Situation and Fabrick of the House, Garden, Library, Chymicall Laboratorie, Anatomicall Theater, Apotheca, with all the Instruments and Furniture belonging to each of them, as also of the whole Policy and Oeconomy thereof. But since such a work could not be brought to passe without much charge (the very naming wherof doth deter men even from the most noble and necessary Attempts) we are contented to pourtray only such a Nosocomium, as may be made out of one of our old Hospitals, without any new donations or creeping to Benefactors, onely with a little paines taken by the Reforming hand of Authority. For we do not doubt, but that we have so contrived the businesse, that there is no Hospitall in its corrupt estate, can be more thriftily managed then Ours. For the Number of our Ministers are no greater then usuall, and absolutly necessary, their Pensions no larger then are allowed to those, who do not make the service of the Hospital, the sixth part of their Employment and meanes of subsistance, and yet we give encouragement enough to able men to undertake it, without medling with any other businesse, which we strictly forbid. For as the Salaries are but small, so the Charge of the Ministers is not great (they being all to be unmarried Persons) their Accommodation handsome, their Employment (being a work of Publike and highest Charity) honourable, and to Philosophicall Men, (who onely are to have a hand in this businesse) most pleasant and delightfull. Besides when their respective times are expired, their profit and esteeme in the world cannot but be very great. For their way of breeding will both procure them practice among such as are able to reward them, and give them a dexterity and ability, to manage and go thorough a great deale thereof.

Moreover the smalnesse of the Salary, the long servitude among poore wretches, and restraint from Marriages, the great paines and naturall parts required to performe duties,

will I hope, prevent all intruſions of thoſe, whoſe Genius doth not encline them to take pleaſure in this way of life.

Wherefore being not at leaſure to frame Utopias, we ſhall onely ſpeak of the Number and Salary of Miniſters, the time of their ſervice with their qualifications in generall, and Duties in particular, which are to be employed in this Noſocomium Academicum.

The Noſocomium being fitted with all manner of Neceſſaries, ſhall be overſeene by three or foure Curators, Men of Learning, Honour and Worth, ſuch as ſhall out of Charity and good will to the Publique performe this Truſt, who are to be Protectors and Chancellors thereof, as alſo Auditors of the Stewards Accompts.

Beſides theſe, there ſhall be a Mathematician for Steward, a Phyſician, Chirurgeon and Apothecary, each well verſed both in the Theory and Practiſe of their reſpective Profeſſions. A young Phyſician capable at leaſt of the degree of Doctor, who may be called the Vice-phyſician, and another of about five or ſixe yeares ſtanding in the Univerſity, who may be called the Student. There ſhould be alſo a Chirurgeon and an Apothecary who have ſerved their Apprentiſhips in the ſaid Faculties called the Chirurgeons and Apothecaries Mate, with two other young men, the one to ſerve the Chirurgeon, and the other the Apothecary, all underſtanding at leaſt the Latine Tongue, which may be called the Apprentices: All theſe are to be choſen at firſt by the Curators (but afterwards by the Society it ſelfe) being ſuch as they ſhall be certified are Pious, Ingenious, Laborious, Lovers of Knowledge, and particularly of the Faculty of Phyſick, courteous, not covetous; and laſtly ſuch among whom there may be an harmony of Natures and ſtudies, ſo as all feare of diſcords, Envie and Emulation may be taken away. There ought alſo to be entertained, as many honeſt carefull ancient Widowes, to ſerve as Nurſes to the ſick, as will be proportionable to their Number, ſome whereof are to be ordinary and ſome extraordinary, whereof the latter may be taken in, and diſmiſſed againe, as Occaſion of their help, requires,

There ſhould be allowed out of the Revenues of the Hoſ-

pitall

pitall to the aforenamed Miniſters, beſides their diets, houſe-roome, waſhing, firing, &c. and Exemption from all Taxes and Employments in the Common-wealth, the ſeverall ſums following, *viz.*

	l.	
To the Steward	80	*per annum.*
To the Phyſician	120	
To the Vice-Phyſician	50	
To the Chirurgeon and Apothec. each	60	
To the Student	25	
To the Chirurg. and Apotheck. mate	20	
To each of the Apprentices	10	
To each ordinary Nurſe	4	
To an Extraordinary by the week	3. ſhil.	

It ſhould be granted by the State, that whoſoever hath ſerved his reſpective time in the Noſocomium, and hath a Certicate therof from the Society, ſhall be thereby licenſed to practice his profeſſion in any place or Corporation whatſover, notwithſtanding any former Law to the Contrary.

The Steward ſhall not be obliged to ſtay any longer then from yeer to yeer. Each of the Faculty of Phyſick may ſerve five yeers in each degree thereof, each of the Chirurgeons and Apothecaries but foure.

Theſe Circumſtances being premiſed, we now come to the very Eſſence of the whole buſineſſe, that is, to the Deſcription of each of the aforenamed Miniſters their particular Duty and Function, which are as followeth, *viz.*

The Steward ſhall be a man of approved honeſty, able to give order for all reparations about the houſe, garden, &c. to agree and bargaine with workmen, and all that ſhall ſerve in any Commodities into the houſe, he is to receive and pay all monies, and ſubmit the accompts thereof to the whole Society, and they againe to the Curators. For which and other like duties he ought to be skill'd in Mathematicks; chifely in Arithmetick and keeping Accompts, meaſuring of Land, timber, board, Architecture, frugall contrivances and the like. But as to the Advancement of Phyſick, We deſire he

may be skill'd in the beſt Rules of Judiciall Aſtrology, which he may apply to calculate the Events of diſeaſes, and Prognoſticate the Weather; to the end that by his Judicious and carefull Experiments, the Wheat may be ſeparated from the Chaffe in that Faculty likewiſe; and what is good therein may be applyed to good uſes, and the reſt exploded. He ſhall keep a Journall of all notable Changes of Weather, and fertility of Seaſons, taking notice what fruits, &c. have abounded and what have failed, which have beene good, and which bad, with the Reaſons thereof, whether the ſame were cauſed by Mildewes, Blaſts, Unſeaſonable Weather, Caterpillers or other Vermin; he ſhall take notice of the ſeverall diſeaſes, as Staggers, Murraine, Rot, &c. which in each yeare have infeſted each Species of Animals, and what Inſects have moſt abounded; all which Particulars with the Epidemicall diſeaſes befalling man, he may compare with the Aſpects of the Celeſtiall bodies, and ſo examine the precepts delivered unto us by the Profeſſors of that Art.

The Phyſician muſt be a Philoſopher, skill'd at large in the Phænomena of Nature, muſt underſtand the Greek Tongue, be well read in good Authors, and ſeene in the practice of all the miniſtrant parts of Phyſick, willing to inſtruct and forward all that are under him, his work ſhall be twice every day deliberately to Viſite and Examine all the Sick, and after due Conſideration of their Condition, to preſcribe them convenient Medicines, and ſhall dictate in Latine to the Vice-Phyſician attending him, the Hiſtory of their ſeverall Diſeaſes (excluding impertinencies) he ſhall ſee all Patients in outward griefes (to whom he adminiſtreth any inward remedies) opened and dreſſed ever now and then, to the end that himſelfe and the Chirurgeon may both have the ſame Intention and ſcope in their practice. He muſt take care that the Chirurgeon and Student keep the Hiſtory of their Cures likewiſe, and that the Apothecary and Student doe the ſame in in their Pharmacy and Botanicks. He ſhall overſee the diſpenſation of all compound, and Preparation of all Chymical Medicaments, giving the Apothecary directions for the making of new Enquiries and Experiments in his way; and

like-

wiſe to the Chirurgeon and the reſt, in theirs, when he ſeeth them not otherwiſe employed. In briefe, he ſhall have an influence upon all the reſt, and all the reſt reciprocally upon him, ſo that he being made acquainted with all the Hiſtories taken in the Hoſpitall, Laboratory, Anatomical Chamber, garden, &c. may give the reaſon of the moſt notable Phænomena hapning in either of them. All which he ſhall commit to writing and out of them, by the end of the terme of his ſervice, ſhall collect a Syſteme of Phyſick and the moſt approved Medicinall Aphoriſmes; taking notice by the way where thoſe of Hippocrates are deficient or true, and by how many ſeverall experiments he hath ſo found them. He ſhall either diſſect or overlook the diſſection of bodies dying of diſeaſes, and laſtly ſhall take care that all Luciferous experiments whatſoever, may be carefully brought to him, and recorded for the benefit of Poſterity.

The Vice-Phyſicians proper charge is to ſee the Hiſtory of Patients moſt exactly and conſtantly kept, he may now and then reade ſome good Authour, but in all other things ſhall endeavour to aſſiſt, and be ſubordinate to the Phyſician in all parts of his duty, ſtil acting by his directions, but ſhall not preſcribe any Phyſick without the conſent of the Chiefe, nor in his abſence, upon emergent occaſions, without the advice of the Maſter Chyrurgeons; he ſhould be alwayes walking up and downe from bed to bed, feeling the pulſes and looking on the Vrine and other excrements of the ſick; that no conſiderable punctilio in any circumſtance whatſoever eſcape his obſervation; for the compleating of the Hiſtory, He ſhall apply himſelfe to the making of Luciferous experiments, and to take notice of ſuch as ſhall be made by others.

The Student ſhall aſſiſt the Chyrurgeon and Apothecary in making the Hiſtory of their Practiſes, to the end he may have alwayes occaſions to inſtruct himſelfe in theſe miniſtrant parts of phyſick to read ſuch Authors, as the Chiefe Phyſician ſhall appoint him, and compare all his reading with the things themſelves, whereof he readeth, as herbs, drugs, Compound Medicaments, Anatomy, Chyrurgicall Inſtruments, bandages, operations, &c. all which we call the Real Elements.

ments of the Art. He ſhall by leave from the Phyſician in caſes of need, put his hand to helpe the Chyrurgion or Apothecary and ſometimes watch by night with the Nurſes, that the perfection of the Hiſtory may by no meanes be hazarded on their Ignorance or careleſneſſe; he may ſerve the Phyſician as an Amanuenſis, eſpecially in ſuch things, the tranſcribing whereof may tend much to the advancement of his owne knowledge.

Of the Chirurgions.

The Maſter Chyrurgion ſhall dreſſe every Patient belonging to his care the firſt time himſelfe, in the preſence of him, to whom he ſhall commit the ſaid Cure afterwards, and as it were read him a Lecture thereupon. When the other Chirurgions under him are dreſſing, he ſhall, accompanied with the ſtudent, goe from Patient to Patient to give them directions *pro re Natâ* in their proceedings on the Cure, and dictate to the Student the moſt pertinent paſſages hapning from time to time, that he may keep a true and uninterrupted Hiſtory of them; He ſhal make Experiments by diſſecting ſundry ſorts of Animals, ſhall teach his Mates Anatomy, expound good Authors to them, ſhew them the Manner of making bandages and making all Manner of operations ſuch as are the Laryngotomia, cutting for the ſtone, hernia, dropſie and applying the trepane both upon living brutes and dead carcaſes of men to the end that by practiſing upon theſe, the beſt places for making inciſion may be knowne, and all the dangerous parts in the way taken notice of, and upon the others, how to avoide the Inconveniences of hæmorrhagies, ſtruglings and the like.

The Mate ſhall dreſſe all the more difficul griefes, apply Cauteries, make Fontanels, practiſe Anatomy, and Manuall operations make Sceletons of the Sundry rare Animals which he ſhall have the opportunity to cut up, excarnate bowels, artificially dry the Muſcules tanne the ventricle, guts, &c. and do what elſe tendeth to the perfection of Anatomy, he ſhall alſo

ſo at leiſuretimes tranſcribe the Hiſtory of their practice firſt and originally taken by the Student.

The Apprentice ſhall ſerve the Maſter in ſpreading Plaiſters, letting Blood in the arme, threading Peaſe for Iſſues, whetting Inſtruments, ſcraping Lint, ſowing together Bandages (which he ſhal alſo learne to apply) he ſhal ſee diſſections, read good Authors of Chirurgery and ſee the practice of operations made by his Superiours. He ſhall alſo ſee the Apothecaries make all ſuch Plaiſters, Unguents, Balſames, &c. (learning to chooſe and know all the Herbs, Gummes and other Ingredients going into them) as are uſed in their practice.

Of the Apothecarie.

The Maſter Apothecary being a moſt exquiſite Botaniſt, ſhall take care of the Garden, that ſtore of all uſefull Plants be kept therein, and alſo that ſuch as are for beauty or rarity be not wanting, he ſhall give order for all Experiments of Grafting, Tranſplanting, Meliorating the taſts, ſmels, &c. of Plants, accelerating of Germination and Maturation in them, conſervation of Exoticks ſo, as in time to make them Domeſticks, to try the effect of all Artificial Compoſts, he ſhall ſee that all Herbs, Roots, &c. be gathered in their due ſeaſons, and that all the moſt proper Courſes be uſed for conſerving them, hee ſhall write of the ſenſile and evident Qualities of all Drugges, as of their ſmell, taſt, ponderoſity, rarity, friability, tranſparency, colour, hardneſſe, &c. omitting ſuch as are not diſcernable by ſenſe, or deprenſible by certaine Experiments, declaring the ſeverall operations, chymicall or Pharmacentical by which theſe Drugges are uſually, or may be beſt prepared; he ſhall ſet down all the Experiments ſolitary or in conſort, that he meeteth with, in the mixing or preparing any of them, as that Camphire, will of it ſelfe evaporate, Terpentine waſhed in

water.

water becometh white, Euphorbium in the beating will cauſe exceſſive ſneeſing, that the ſeedes of Cucummis Aſininus will of themſelves leap out with great Impetuoſity one after another. That ſpirit of Vitriol mixed with Syrup of Violets, turneth it into a faire Crimſon colour, and others of the like Nature. He ſhall with the Student keep an exact Hiſtory af all rare and Unuſuall Accidents, hapning in his Operations, he ſhall take care that all Medicaments be made according to Art, or the Phyſicians particular directions: he ſhall ever now and then Viſite the Apotheca, to caſt out thereof all decayed Drugges and compoſitions, ſhall read Pharmaceutical and Chymicall Inſtitutions to his Inferiors, and teach the plants to any of the Society that ſhall deſire to learne them.

The Apothecaries Mate ſhall tranſcribe the preſcriptions taken by the vice Phyſician, and ſee them carefully made up, ſhall attend the Hoſpitall, in adminiſtring to each Patient his Phyſick according to directions, applying Epithemes, cucuphaes Embrochaes, fomentations, frictions, unctions, giving Glyſters, applying Leeches, &c. he ſhall tranſcribe the Hiſtory compiled by the Maſter Apothecary, and the ſtudent, and at leiſure times, when as he cannot ſtudy Things he may read good Authors in his owne Art, without meddling either with Phyſick or Chyrurgery.

The Apprentice ſhall read ſome good pharmaceuticall Botanick and Chymicall Inſtitutions, ſhal be much converſant in the Garden to ſee the curing of tender and exotick plants where he ſhall obſerve the working of Nature in their growing flouring, &c. he ſhall ſee the Herbs, Roots and Seeds gathered according to directions, he ſhall worke in beating and picking Drugs and on all other Operations belonging to the preparation of Medicaments.

The Nurſes ſhall be alwayes at hand in the Hoſpitall to help the ſick, that by reaſon of their abſence they may not be put to ſtraine and offend themſelves by often and loud crying and calling. They ſhall dreſſe their diet

and

and give it them in Quality, Quantity, Time and order, according to the Phyſicians directions, they ſhall ſee their Linnen conveniently changed ſo as to prevent all annoyance to the ſick; They ſhall in watching endevour to obſerve all remarkable Accidents hapning in the night, as whether they raved or talked much in their ſleepe, ſnorted, coughed. &c. all which they ſhall punctually report to the Phyſician, ſhewing him the Urines and other Excrements, telling him the time and manner wherein they were voyded, and in breife, they being the loweſt Members of the houſe, they ſhalbe in all things obedient to their Superiours.

It is hard ſo to aſſigne to every Miniſter his particular duty, as that the buſineſſe (which is the Recovery of the Patients, and the Improvement of every mans knowledge in his proper way) cannot be done better then by this diſtribution: And it would be of ill Conſequence, if hereupon the Apprentice having done his owne work, ſhould refuſe to help his fellow, being perchance at ſome time overburthened, wherefore it is to be underſtood that this contrivance ſhalbe no warrant to any man, not to help his fellow, in caſe of Exigence, but chiefely to ſhew what we deſire ſhould be done amongſt them all. For we hope that their common Frendſhip and deſire of helping the ſick and enabling themſelves, will tye them enough to performe all theſe things in the moſt advantagious manner to theſe Ends.

Having now after a faſhion gone through the deſcription of ſuch Societies and Inſtitutions, as we have thought moſt fit for the advancement of Reall Learning, and among the reſt, of the *Ergaſtulum Literarium* for the Education of Children, we now come to ſpeak of ſuch Bookes, as being well ſtudied and expounded in thoſe Schooles, would lay a very firme foundation of Learning in the Schollers.

We recommend therefore in the firſt place (beſides thoſe Bookes of Collection, by us formerly mentioned, and Maſter *Pells* three Mathematical Treatiſes) the compiling of a

Worke whose Title might justly be *Vellus Aureum sive Facultatum Luoriferarum discriptio Magna*, wherein all the practised wayes of getting a Subsistance and whereby Men raise their fortunes, may be at large declared. And among these, we wish that the History of Arts or Manufactures might first be undertaken as the most pleasant and profitable of all the rest, wherein should be discribed the whole Processe of Manual Operations and Applications of one Naturall thing (which we call the Elements of Artificials) to another, with the necessarie Instruments and Machines; whereby every peice of worke is elaborated, and made to be what it is, unto which work bare words being not sufficient, all Instruments and tooles must be pictured, and colours added when the discriptions cannot be made intelligible without them.

This History must not be made out of a farrago of imperfect Relations made to the compiler, either by too rude or cousening Workmen, but all things thereunto appertaining must be by himselfe observed and attested by the most Judicious and candid of each respective Profession, as well to make the work the more Authenticke, (it being to be the Basis of many future Inferences and Philosophations) as the more cleerly and distinctly to enforme the compiler himselfe, by whose Judgement as the Alembick and Industry as the fire, it is hoped that the Quintessence and Magesteries of all present Inventions may be extracted and new ones produced in abundance.

Although it be intended to teach the making of all Artificials, yet it is not to be understood that when there hath beene taught how to make a stoole, or a naile of one fashion, that the Art of making a Chaire or a naile of another fashion, should belong insisted on. But the Compiler should strive to reduce the making of all Artificials in each trade to a certaine Num ber and Classes of operations Tooles and Materials, neither need he to set the Figures, or mention the names of all Artificials that ever were made, but onely of such as are most Knowne and of Common Use

amongst

amongſt men: He needeth not to deſcribe every punctilio in making all the aforementioned particulars, and yet leave no more defects, then may be ſupplyed by every common underſtanding. For we queſtion whether (if he ſhould engage himſelfe in ſuch an endleſſe labour) a man by the bare light and inſtruction of the Book could attaine to a dextrous practice of a trade, whereunto hath been required ſeven yeares Autopſia. But are confident that the help of this Book will leſſen the former tæditum by more then half. He ſhould not ſo abridge the Work as not to diſtinguiſh between Inſtruments of the ſame name, as between a Loome to weave Kerſies, and another, wherein to weave ſilk Ribbands or Stockings.

He ſhould all along give the Mechanicall reaſon of every Inſtrument Materiall and operation, when the ſame is ſenſible and cleere. He ſhould all along note his own defects in ſetting down theſe Hiſtories, in caſe he had not at the time of the writing thereof ſufficient information, and withall the deficiencies of the Trades themſelves.

Now whereas there be divers Wayes and Methods of working moſt Manufactures, he ſhould in each thing ſtick cloſe to the way of ſome one Mr. but note al the diverſities he Knoweth, & give his Opinion of the uſe and goodnes of each.

Moreover the Oeconomy, *Sive Ars augendæ rei familiaris* in all Profeſſions ought to be enquired into. *viz.* What ſeaſons of the yeare are moſt proper to each Worke, which the beſt places and times to buy Materials, and to put off the Commodities when finiſhed, how moſt thriftily to hire, entertaine, and overſee ſervants and Workmen, how to diſpoſe of every excrement and Refuſe of Materials, or of broken, worne, or otherwiſe unſerviceable Tooles and Utenſils, with all Cauteles, Impoſtures and other ſleights good or bad, whereby men uſe to over-reach one another.

There ought to be added to this work many and various indices beſides the Alphabeticall ones, as namely one of all the Artificials mentioned in the whole worke.

Another of all the Naturall Materials or Elements of Artificials, by what Artificers uſed, from whence they come,

where to be had, and what are the ordinary and middle prices of them.

Another of all the Qualities or Schemes of Matter, as of all liquifiable things viſced friable, heavy, tranſparent, abſterſive or otherwiſe qualified according to all the claſſes of 1, 2, and 3. qualities, to the end that Materials for all Intentions and Experiments may be at hand and in ſight.

Another of all Operations mentioned in the whole work, as Sawing, Hewing, Filing, Boaring, Melting, Diſſolving, Turning, Beating, Grinding, Boyling, Calcining, Knitting, Spinning, Sowing, Twiſting, &c. To the end that they all may alſo be at hand for the purpoſes aforeſaid. Another of all Tooles and Machines, as Files, Sawes, Chiſſels, Sheeres, Sives, Loomes, Shuttles, Wheeles, Wedges, Knives, Skrewes, &c. for the ſame purpoſe alſo.

The compiler ought to publiſh all his conjectures, how old Inventions may be perfected and new one produceds, giving directions how to try the truth of them. So that by all thoſe unto whoſe hands theſe Books ſhall come perchance, all the ſaid ſuppoſitions may be tryed, and the ſucceſſe reported to the Compiler himſelfe.

The Compilers firſt ſcope in Inventions ſhall bee, how to apply all Materials that grow in Abundance in this Kingdome, and whereof but in conſiderable uſe and Profits are as yet made to more advantage to the Common-wealth. And alſo how all Impotents, whether onely blind, or onely lame, and all Children of above ſeven yeares old might earne their bread, and not be ſo long burdenſome to their Parents and others.

There ſhould be made a Preface to the Worke to teach men how to make the moſt of experiments and to record the ſucceſſes of them whatſoever, whether according to hopes or no, all being equally Luciferous, although not equally Lucriferous.

There ought to be much Artifice uſed, that all the aforementioned Indices may handſomely referre One to anothers, that all things contained in the whole Book may

may be moſt eaſily found, and moſt readily attend the ſeekers of New Inventions.

The way to accompliſh this Worke muſt be to enquire what to this purpoſe is already done, or in hand, in all places and alſo by whom, ſo that Communication of councels and proceedings, may (if poſſible) be had with thoſe undertakers.

All Bookes of this Subject already extant in Print, muſt be collected and bought, not to tranſcribe them, but to examine them per Autopſiam, and Re-experiment the Experiments contained in them, and withall to give hints of New Enquiries.

The Compiler muſt be content to devote his whole life to this employment, one who (as we ſaid before) hath the fire of Induſtry and the Alembick of a Curious and rationall head, to extract the Quinteſcence of whatſoever hee ſeeth.

He ſhould bee as young as ſufficient Abilities will admit, to the end that he may with the concurrence of Gods ordinary Providence, either finiſh, or very farre advance the Worke, while he liveth, and alſo that living long in that employment, he may heap up the larger ſtock of Experiments, which how much the greater it is in one Man, affordeth ſo much the more hopes of New Inventions.

The Nature, Manner, and Meanes of Writing the Hiſtory of Trades being ſo farre expounded, before we proceed further therein, for the better Encouragement of Vndertakers, we ſhall now repreſent ſuch Profits and Commodities thereof, to the Common-wealth, as we at preſent more nearly reflect upon. For to Enumerate or Evaluate them all, will be much above our Capacity.

1. All men whatſoever may hereby ſo look into all Profeſſions, as not to be too groſſely cozened and abuſed in them.

2. The Myſteries of Trades being ſo laid open, as that the Profeſſors of them cannot make ſo unlawfull and exorbitant

advantages as heretofore, Such as are Cunning and Ambitious will never reſt untill they have found new ones in their ſtead; ſo that the *Reſpublica Artium*, will be ſo much the more advanced.

3. Schollers and ſuch as love to Ratiocinate will have more and better Matter to exerciſe their wits upon, whereas now they puſle and tire themſelves, about meer Words and Chymæricall Notions.

4. They will Reaſon with more alacrity, when they ſhall not only get honour by ſhewing their Abilities, but profit likewiſe by the Invention of Fructiferous Arts.

5. Sophiſtry ſhall not be in ſuch eſteem as heretofore, when even Sence ſhall be able to unmask its vanity, and diſtinguiſh it from Truth.

6 Men ſeeing what Arts are already invented, ſhall not neede to puſlle themſelves to reinvent the ſame againe.

7. All Men in generall that have wherewithall will be venturing at our *Vellus Aureum*, by making of Experiments: and whether thereby they thrive or no (the Directions in the Preface being followed) they ſhall nevertheleſſe more and more diſcover Nature.

8. Nay all Nations ſenſible of this *Auri Sacra fames*, will engage in this hopefull buſineſſe; and then certainly Many hands will make light work in the ſaid buſineſſe of diſcovering Nature.

9. All Ingenious Men and Lovers of Reall Knowledge, have along time begged this work, wherefore it can be no ſmall honour to him that ſhalll ſatisfie them.

10. A vaſt increaſe of honourable, profitable, and pleaſant Inventions muſt needs ſpring from the work, when one Man (as the Compiler thereof) may *uno intuitu*, ſee and comprehend all the Labour and Wit of our Anceſtors, and be thereby able to ſupply the defects of one Trade with the perfections of another.

11. We ſee that all Countries where Manufactures and Trades flouriſh, as *Holland*, &c, become potent and rich.

For

For how can it otherwiſe be ? when the Revenues of the State ſhall be encreaſed by new and more Cuſtomes, all Beggers feeding upon the Labours of other men, and even Theeves and Robbers (made for want of better employment) ſhall be ſet on work, barren grounds made fruitfull, wet dry, and dry wet, when even hogs and more indocile beaſts ſhall be taught to labour, when all vile Materials ſhall be turned to Noble uſes, when one man or horſe ſhall do as much as three, and every thing improved to ſtrange Advantages.

12. There would not then be ſo many Fuſtian and Vnworthy Preachers in Divinity, ſo many petti fogggers in the Law, ſo many Quack-ſalvers in Phyſick, ſo many Grammaticaſters in Country-ſchooles, and ſo many *Lazy*-ſerving men in Gentlemens houſes, when every man might learne to live otherwiſe in more plenty and honour. For all men deſirous to take paines might by this Book ſurvey all the wayes of Subſiſtance, and chooſe out of them all, one that beſt ſuits with his own Genius and Abilities.

13. Schollers now diſeſteemed for their Poverty (what ever other thing commends them) and unable even for want of lively-hood, to perfect any thing even in their own way, would quickly help themſelves, by opening Treaſures, with the Key of Lucriferous Inventions.

14. Boyes in ſtead of reading hard Hebrew words in the Bible (where they either trample on, or play with Myſteries), or parratlike repeating heteroclitous nounes, and verbs, might read and hear the Hiſtory of Faculties expounded, ſo that before they be bound Apprentices to any Trade, they may foreknow the good and bad of it, what will and ſtrength they have to it, and not ſpend ſeven years in repenting, and in ſwimming againſt the ſtream of their Inclinations.

All Apprentices by this Book might learn the Theory of their Trades before they are bound to a Maſter, and conſequently may be exempted from the *Tædium* of a

ſeven

ſeven years bondage, and having ſpent but about three years with a Maſter, may ſpend the other foure in Travelling to learn breeding, and the perfection of their Trades.

As it would be more profitable to Boyes, to ſpend ten or twelve years in the ſtudy of Things, and of this Book of Faculties, then in a rabble of words, ſo it would be more eaſie and pleaſant to them, as more ſuitable to the naturall propenſions we obſerve in them. For we ſee Children to delight in Drums, Pipes, Fiddels, Guns made of Elder-ſticks and bellowes noſes, piped Keyes, &c. for painting Flags and Enſignes with Elder-berries and Corn-poppy, making ſhips with Paper, and ſetting even Nut-ſhels a ſwimming, handling the tooles of workemen aſſoone as they turne their backs, and trying to worke themſelves, fiſhing, fowling, hunting, ſetting ſprenges and traps for birds, and other animals, making pictures in their writing bookes, making Tops, Gigs, and Whirligigs, quilting balls, practiſing divers jugling tricks upon the Cards, &c. with a million more beſides. And for the Females, they will be making Pyes with Clay, making their Babies Clothes, and dreſſing them therewith, they will ſpit leaves on ſticks, as if they were roaſting meate, they will imitate all the talke and Actions, which they obſerve in their Mother and her Goſſips, and punctually act the Comedy or Tragedy (I know not whether to call it) of a Womans lying in. By all which it is moſt evident, that Children do moſt naturally delight in things, and are moſt capable of learning them, having quick Sences to receive them and unpreoccupied memories to retaine them. As for other things whereunto they are now adayes ſet, they are altogether unfit, for want of judgement, which is but weake in them, and alſo for want of *Will*, which is ſufficiently ſeene both by what we have ſaid before, by the difficultie in keeping them at Schools, and the puniſhment they will endure rather then be altogether debarred from this pleaſure which they take in Things.

This

This work will be an help to Eloquence, when men by their great acquaintance with things, might find out Similitudes, Metaphors, Allusions, and other graces of discourse in abundance.

To Arithmeticians and Geometricians, supplying them with Matter whereupon to exercise those most excellent Sciences, Which some having with much paines once learned, do for want hereof forget againe, or unprofitably apply about resolving needlesse Questions, and making of new difficulties. The number of mixt Mathematicall Arts would hereby be encreased.

For we see that Opticks are made up of pure Mathematicks, the Anatomy of the eye, and some Physicall Principles concerning the Nature of light and Vision, with some Experiments of convexe, and concave glasses, Astronomy is constituted againe of them, and some Cæleſtiall Phœnomena. Enginry againe of them, and some Propositions *de Cochleâ et Vecte*. And so certainly as the number of Axioms concerning severall subjects doth encrease by this work, so the Number of (their Applications to pure Mathematicks, *id est*,) New Mathematicall Arts, will encrease also.

Divines having so large a Booke of Gods works added to that of his word, may the more cleerely from them both, deduce the wisedome, power and goodnesse of the Almighty.

Physicians observing the use of all Drugs and Operations in the production of Artificials, may with successe transferre them to better Vses in their Art.

And Lawyers when they plead concerning Trades and Manufactures, would better Know what to say on such Occasions.

A young beginner may Know by this Book how much stock is needfull to set him up in his Trade.

Gentlemen falling sometimes Accidentally into Tradesmen and handicrafts company, would Know how to make use of such Occurrences to advantage.

Lastly, This History with the Comments thereupon, and the Indices, Preface and Supplements thereunto belonging would make usable (if it be at all possible) to demonstrate Axioms in Philosophy, the Value and dignity whereof cannot be valued or computed.

The next Booke which we recommend is the History of Nature free, for indeed the History of Trades is also an History of Nature, but of Nature vexed and disturbed. What we meane by this History, may be known by the Lord *Verulams* most excellent Specimen thereof, and as for the particulars that it should treat on, we referre to his Exact and Judicious Catalogue of them, at the end of his Advancement of Learning.

FINIS.